

有向图中网络Euler-Lagrange系统的自适应协调跟踪

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收稿日期 2010-9-15 修回日期 2010-11-24 网络版发布日期 接受日期

摘要

基于一致性理论, 在有向图中研究网络 Euler-Lagrange 系统的协调跟踪控制. 所有跟随智能体的动力学模型均为 Euler-Lagrange 方程. 在仅有部分跟随智能体获取领航智能体信息的情形下, 同时考虑系统模型的参数不确定性, 设计分布式自适应控制律实现所有跟随智能体对领航智能体的跟踪. 针对领航智能体的运动状态, 考虑以下两种情形: 1) 领航智能体为固定点; 2) 领航智能体为动态点. 对第一种情形, 设计的控制律使得所有跟随智能体渐近交会于固定点; 对第二种情形, 首先对每个跟随智能体设计分布式连续估计器, 然后提出了分布式自适应控制律. 当每个跟随智能体均能获取领航智能体的加速度信息时, 设计的控制律能实现对领航智能体的渐近跟踪, 当跟随智能体不能获取领航智能体的加速度信息时, 跟踪误差是有界的. 最后通过仿真分析验证设计的控制算法是合理有效的.

关键词 [多智能体系统](#) [协调跟踪](#) [分布式控制](#) [自适应控制](#) [Euler-Lagrange系统](#)

分类号

Adaptive Coordinated Tracking for Networked Euler-Lagrange Systems under a Directed Graph

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Abstract

In this paper, we study a distributed coordinated tracking problem for networked Euler-Lagrange systems under a directed graph based on consensus theory. The purpose is for a team of followers modeled by Euler-Lagrange equations in the presence of parametric uncertainties to track a leader under the constraint that only a subset of the followers can receive the information of the leader. We consider two cases: 1) the leader is a stationary point; 2) the leader is a moving point. In the first case, we propose a distributed adaptive control algorithm, by which all followers can rendezvous at the stationary point asymptotically. In the second case, we propose a distributed continuous estimator and a distributed adaptive control algorithm. We show that with the proposed control algorithm, all followers can track the dynamic leader asymptotically if the acceleration of the leader is known to each follower, and we give a bound of the tracking error if the acceleration of the leader is unknown. Simulation results are provided to show the effectiveness of the proposed control algorithms.

Key words [Multi-agent systems](#) [coordinated tracking](#) [distributed control](#) [adaptive control](#) [Euler-Lagrange systems](#)

DOI: 10.3724/SP.J.1004.2011.00596

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